

▪ **Basic Research**  
**Effect of Developing and Implementing Nursing Care Standards on Patients' Outcomes Regarding Ureteral Stent**

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**Abstract**

**Background:** Ureteral stents are one of the most essential techniques utilized in the therapy of various urological disorders for preserving ureteral patency. Although they are highly effective, most patients suffer stent-related side effects, and some have problems connected to them that may be prevented by nursing care and conventional procedure. **Aim:** To evaluate the effect of developing and implementing nursing care standards on patients' outcomes regarding ureteral stent. **Research design:** A quasi-experimental research design was employed to attain the purpose of the present study utilizing a pre-/post-test technique. **Setting:** The current research was conducted out in three settings; the urology surgery department, the urology department and the urology outpatient clinic of university Hospital in Benha, Qalyubia Governorate, Egypt. **Subject** A convenient sample of 40 nurses of both genders who assigned care for the ureteral stent patients and a purposive sample consisting of 72 patients from the previously mentioned settings within nine months were enrolled in this study. **Tools:** Data were gathered using three distinct tools: (I) a structured questionnaire for nurses that asked about personal information and knowledge of ureteral stent management; (II) an observational checklist for nurses' practice; and (III) interviewing questionnaire for patients' assessments. **Results:** Total nurses' knowledge and practice level scores showed significant increase after the nursing care standards implementation. There was a marked improvement in total patients' outcomes as shown by a decline in mean scores for pain both immediately and one month after the introduction of the nursing care standards, there was a significant improvement in all patient outcomes. Additionally, there was an immediate and post one month of implementation statistically significant negative correlation between nurses' knowledge, practice, and total (ureteral stent symptoms and ureteral stent discomfort) of the studied patients, while it was statistically significant positive correlation before implementation of the nursing care standards ( $P = <0.001$ ). **Conclusion:** The implementation of nursing care standards had a significant positive impact on the knowledge and practice scores of nurses who were exposed to ureteral stents, as evidenced by a decrease in the mean scores for discomfort and total ureteral stent symptoms. **Recommendations:** To provide high quality nursing care for patients with ureteral stents, there is a need for an ongoing planned education and training program that is regularly offered to nurses. This program should help nurses advance their knowledge and practice in accordance with the recommendations of nursing care standards. **Keywords:** Nursing care standards, Patients' outcomes, Ureteral stent

## I. Introduction

A common technique used by urologists in a number of urological surgeries is the implantation of ureteral stents. (1). The ureters, which allow urine to move from the kidneys into the bladder, are kept open by a hollow tube with multiple side holes. (1). Stent usage is predicted to rise as the incidence of kidney stone disease (KSD) rises (2). Over the past few decades, there have been more and more reasons to perform a surgical operation called stenting. Bilateral ureteral obstruction, total obstruction from benign or malignant conditions, obstructed pyelonephritis, obstruction of a single functioning kidney, pre-shockwave lithotripsy of big stones during pregnancy, partial nephrectomy, and partial nephrectomy to avoid ureteral obstruction by stone pieces (1). A ureteral stent is implanted in the operating room under fluoroscopy supervision and cystoscopy guidance. The stent is inserted into the ureter using a soft guide wire. (2, 3). There are several distinct stent designs that come in various sizes, shapes, coatings, and materials. (3). The stent designs aim to increase patient comfort, facilitate stent handling, and lower the risk of encrustation and UTI. (2).

It is common practice to treat a variety of urological illnesses with ureteral stents. The majority of patients encounter stent-related side effects, and some experience issues such as generalized urinary pain or blockage or urinary tract infection (1, 4). A large percentage of ureteric stents may fail, which can have a detrimental effect on patients' quality of life (QoL), increase their risk for sexual dysfunction, and have a severe impact on their vitality and social life. (4, 5). Even though stent design has changed dramatically, the ideal stent will be free of problems and negative effects. The adverse effects linked to stents increase with passing time. Therefore, the best treatment to lessen a stent's negative effects is to remove it as soon as feasible. While ureteral stents are often only required temporarily in patients with chronic conditions, this is not always the case. It shouldn't stay for more than three months because if it does, a stone will form right on the stent, making removal difficult (5).

Two to three days after ureteroscopy, in simple cases, the stents can be taken out; one to two weeks later, in patients with ureteral perforation or chronic blockage. The string is gently pulled out of the patient's urethra to facilitate stent removal in the outpatient (OP) clinic using a flexible ureteroscope and grasper, typically under topical anesthesia. For patients who cannot tolerate local anesthesia, stent removal is also performed in the operating room (OR) under general anesthesia. If there isn't a string, the stent is simply removed by inserting a cystoscope via the patient's urethra and into the bladder (6). Potential

issues include stent migration within the urinary system, encrustation, retained stents, stone growth, and fragmentation have developed as a result of the increased usage of ureteral stents. The majority of ureteral stent-related complications are mechanical in nature. The most frequent side effects related to the placement of ureteral stents range from minor discomfort to serious problems including urgency, hematuria, bladder spasms, dysuria, back pain while urinating or walking, and bladder pain (5,6). With the rate of stent bacterial colonization reported to be above 90% in some investigations, it may also cause urinary tract infections (UTIs) and lower urinary tract infections (LUTS). Clinicians and research teams have been putting a lot of effort into improving stent design in order to lower the risk of problems, which may boost patient outcomes and quality of life (QoL). As a result, the quest for the ideal ureteric stent goes on.

Nursing care for patients with ureteral stents requires the knowledge of a nurse who is knowledgeable with the many problems that may develop and the evaluation abilities to help them. Prior to and during ureteral stent placement, nursing expertise is combined to maximize short- and long-term results, guarantee a safe and successful surgery, and minimize problems (7). Education of patients is crucial, and they should know that ureteral stents are temporary implants that need to be replaced frequently and removed when no longer needed. Patients also need to know the risks associated with ureteral stents and how to manage them. In order to prevent problems and contribute to the success of the ureteral stent, a nurses' responsibility involves not only patient training but also monitoring and care for the patient following stent installation. Nursing care standards are the professional nursing skills that a nurse exhibits when providing patient care. The definition of a standard is "a criteria for achievement determined by a desired level of excellence." Standards of care define the appropriate degree of nursing care and evaluate the level of nursing competence. All standards of practice provide a roadmap for the knowledge, abilities, decisions, and attitudes necessary to engage in safe practices. (3, 7).

### **Significance of the research**

The regular use of ureteral stents in urology is well known to be a challenging procedure that stresses out patients and their families. which differ from patient to patient are frequently linked to significant morbidity and are regarded as a global issue (8). According to several studies, Egypt lacks a defined national reporting system, making it impossible to get precise stent information. The number of urology patients admitted to Benha University Hospital in 2020 was recorded. reaches 241 patients in the urology department of Benha University Hospital, according to the hospital's statistics office in 2020

(26). All members of the healthcare team must prioritize meeting nursing care standards. Additionally, it helps these patient groups get nurse standards of care that lessen issues and enhance patient outcomes. Additionally, it lowers the cost of therapy (3, 7, 8).

### **Research aim**

This study was conducted to evaluate the effect of developing and implementing nursing care standards on patients' outcomes regarding ureteral stent through: 1. Assess the nurses' level of knowledge regarding ureteral stent. 2. Assess the nurses' level of practice regarding care for patients with ureteral stent. 3. Develop and implement nursing care standards for patients with ureteral stent. 4. Evaluate the effect of implementing the developed nursing care standards on nurses' knowledge, practice and patients' outcomes.

**Research hypotheses:** The following hypotheses were developed in order to fulfill the study's aim:

**H1:** The post mean total knowledge score of nurses after implementing the developed nursing care standards regarding ureteral stent could be higher than their pre mean knowledge score before implementation.

**H2:** The post mean total practice score of nurses after implementing the developed nursing care standards regarding ureteral stent could be higher than their pre mean practice score before implementation.

**H3:** The post ureteral stent complications for patients cared by nurses after developed nursing care standards implementation could be significantly lesser than that developed pre-implementation.

**H4:** There could be a correlation between knowledge and practice score obtained by nurses receiving the developed nursing care standards and patients' outcomes.

### **Operational definition**

**Nursing care standards:** It assess in terms of nurses' level of knowledge and practice regarding ureteral stent in which nurses describe a competent level of nursing care through the nursing process which help in minimizing complications and improving patients' outcomes (3).

**Patients' outcomes:** Are the primary indicators used to gauge the effectiveness of patient treatment. This study includes patient pain following ureteral stent insertion and reduces the number of ureteral stent-related problems as a result of patient physical evaluation known as ureteral stent symptoms.

### **Subject and methods**

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**Research design:** A quasi-experimental research design was used to achieve the aim of the present study using a pre-/post-test approach. A quasi-experimental design is defined as an empirical interventional study used to estimate the causal impact of an intervention on its target population without random assignment <sup>(10)</sup>.

**Research variables:** This study's independent variable is the developed nursing care standards provided for the nurses regarding ureteral stent management, while the dependent variables are: Nurses' knowledge, practices, and patients' outcomes.

**Research setting:** The current study was conducted in three settings; the urology surgery department, the urology department and the urology outpatient clinic of university Hospital in Benha, Qalyubia Governorate, Egypt. The urology surgery department is in the second floor of the hospital. The patients are received in the urology department after placement of ureteral stent. The urology department was located on the third floor of the medical building and included five rooms (two rooms for males, two rooms for females each room contained five beds and one room for dressing. Then stent removal is done under a topical anesthesia in the outpatient (OP) clinic according to the patient condition. The nurse-patient ratio in the urology surgery department is nearly 1:2, in urology department is nearly 1:3, but in outpatient clinic is nearly 1:4.

## Subject

**a. Nurses:** A convenient sample of 40 nurses was selected who were working in the above stated places and in fact who provide direct care for patients. The total number of available nurses were 45 nurses, 5 nurses were excluded from the study for the pilot study.

**b. Patients:** Purposive sampling technique was be used for selected the sample size from the patients undergoing ureteric stents in the previously stated settings. The sample size was determined based on the previous year census report of admission in the urology department from Benha University Hospital Census (2020) <sup>(26)</sup> utilizing the following equation (Thompson, 2012) <sup>(9)</sup>.

$$n = \frac{N \times p(1-p)}{\left[ N-1 \times \left( d^2 \div z^2 \right) + p(1-p) \right]}$$

The estimated sample size is **81** patients out from 241 patients who admitted in previous mentioned settings, at confidence level 95% (**Thompson, 2012**)<sup>(9)</sup>.

Where: **n**= sample size

**N**= total size

**Z**= 1.96

**d**= error level 5%

**p**= 0.5.

**The flow of study participants (patients) during data collection was as follow**, 9 of them were excluded from data analysis because four of the patients withdrawn from the study without giving any explanations, three patients had failed to follow up (unable to reach at follow-up period) and two of them were died. In the end, **72** patients were allocated to the study.

### **Inclusion criteria**

#### **a- Nurses**

Nurses' with different qualifications (Nursing diploma, technical institute of nursing, bachelorette degree & postgraduate studies) and actually who provide direct care for patients with ureteral stent, their experience not less than two years, both male and female, they agreed to take part in the study and were between the ages of 21 and 50, while nurses attended any programs related to the ureteral stent management were excluded from the study.

#### **b. Patients**

Adult conscious patients aged 20- 60 years old of both sexes, patients with the first time for a stent and the stent remain more than three months, patients who agreed to participate in the study and able to communicate effectively, free from other diseases such as infectious disease, while patients with physical or mental handicapped were excluded from the study.

### **Tools for data collection**

**Three tools were used to collect data for this study.**

**Tool I- A structured questionnaire for nurses**, designed by the researchers and written in simple clear Arabic language after examining recent relevant literatures and scientific references<sup>(1, 2, 3, 6, 7)</sup>, and contained two parts:

**Part (1): Nurses' personal data** as age, sex, qualification, years of experiences, and participation of any previous training courses about ureteral stent management.

**Part (2):** It was concerned with assessment the nurses' knowledge regarding ureteral stent management pre, immediate post and after one month implementation of the nursing care standards, it included 49 multiple choice questions to cover all knowledge items; it consisted of the following five sections:

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**Section I:** Covered nurses' knowledge regarding general information about ureteral stent. It included 9 questions.

**Section II:** Covered the studied nurses' knowledge about ureteral stent complications. It included 10 questions.

**Section III:** Covered nurses' knowledge regarding nursing care for patients with ureteral stent. It included 7 questions.

**Section IV:** Covered nurses' knowledge regarding patient teaching about ureteral stent. It included 12 questions.

**Section V:** Covered nurses' knowledge regarding stent removal. It included 11 questions.

**Nurses' knowledge scoring system:** For each question, the correct answer received a score of one, while the incorrect answer received a score of zero. Knowledge was given a total grade of (49). These scores were summed-up and converted into a percent then classed as follows: If the score 85% or more (41.65 degrees or more) is considered satisfactory level of knowledge, while if its less than 85% (Less than 41.65 degrees) is considered unsatisfactory level of knowledge.

**Tool II: Observational checklist for nurses' practice:** It was constructed by the researches after studying recent pertinent literature and scientific references for the intention of evaluating the nurses' practices pre, immediately post, and one month post the introduction of the nursing care guidelines relating stent care (15, 16, 17). This tool included 19 standardized nursing stages for stent care that must be followed while doing the surgery that the researchers would be evaluating.

**Nurses' practice scoring system:** Two score was given for each step that done correctly and complete, one for each step done correct incomplete and zero for the step that done incorrectly or not done. Inapplicable means that the nurses were not able to apply the principles of the standard due to shortage in supplies and equipment, not due to shortage or negligence from the nurses. The overall nurses' practice scores of the checklist were (38 grade). The scoring level was classified as follows: If the score equal 85% or more (32.3 degrees or more) is considered an adequate level of practice, while if its less than 85% (Less than 32.3 degrees) is considered an inadequate practice level.

**Tool III: Patients' assessment interview questionnaire:** It was used to assess expected patients' outcomes (complications) that might develop among patients with ureteral stent pre and post implementation of the nursing care standards in addition to some selected biosocial characteristics for patients. It was included four parts as follows:

**Part (1): Patients' personal data:** This part was dealt with assessment of patients' personal data related to their age, sex, educational level, occupation, marital status and residence.

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**Part (2): Patients' medical history and stent-related data:** It includes questions about medical diagnosis, presence of chronic diseases, lesion site, stone sizes, and types of ureteral stents.

**Part (3): Ureteral Stent Symptoms Questionnaire (USSQ):** This part was adapted from **Tanidir et al. (2016)** <sup>(11)</sup> and modified by the researchers to assess the patient physically and evaluate stent related symptoms. It was used three times pre, immediate post and one month follow up post implementation of the nursing care standards, it includes a total of 30 questions and covered the following five sections: Urinary symptoms (10 questions), pain (7 questions), general health (6 questions), work performance (4 questions), and sexual matters (3 questions) .

**Ureteral stent symptoms scoring system:** The Ureteral Stent Symptoms Questionnaire (USSQ) was a five point Likert scale. Each question was rated from 1-5 grades. Never (1), occasional (2), sometimes (3), usually (4), and always (5); with overall score was 150 scores. They are presented as mean and SD, with the higher the score, the more frequent the symptoms.

**Part (4): Ureteral Stent Discomfort Test (USDT):** This test was adopted from **Ramirez et al. (2019)** <sup>(5)</sup>. It is standardized test designed to assess the ureteral stent-discomfort. It was used three times pre, immediate post and one month follow up post implementation of the nursing care standards, it includes 13 questions.

**Ureteral stent discomfort test scoring system:** Ureteral Stent Discomfort Test (USDT) was scored on a five-point scale, each scale question ranged from 0-5 grades; (0 = never, 1= rarely, 2 = very rarely, 3 =sometimes, 4 = more than half the time, 5 = always); whereby a lower score indicates decrease of ureteral stent discomfort while higher scores denote increase of stent discomfort .

**Nursing care standards booklet for ureteral stent management:** The nursing care standards were developed by researchers based on the resources available through a survey of recent pertinent literature and scientific references (1, 2, 3, 7). For the purpose of enhancing the nurses' capacity for learning, the training manual was prepared in straightforward Arabic with colored illustrations. For nurses caring for patients with ureteral stents, it was intended to address knowledge and practice relevant to applying nursing care standards. Following the pretest, each nurse received one; It had two components: Theoretical component It covered the following topics: general information about the anatomy and physiology of the urinary system; information about ureteral obstruction (definition, reasons for uses of ureter stent, symptoms, contraindications, complications, diagnosis, treatment, and complication; the technology of breaking stones with



shockwaves); information about ureter stent; and information about ureter stent removal, information on post-stent recommendations, including medication therapy, lifestyle changes including resting, eating a nutritious diet, and exercising to remove ureter stones, the significance of follow-up, and when it is required to contact a doctor. The practical portion contained nine key broad competencies that were then broken into sub competencies. It was focused on nurses' practices about fundamental nursing competence for patients undergoing ureteral stent treatment: 1. Ensure that each patient's preoperative care needs are fulfilled specifically. 2. Ensure that the operating room follows correct infection control procedures. 3-Make sure that every patient receives enough nursing care both during the ureteral stent implantation and after it is removed. 4-Confirm that each patient meets the postoperative requirements. 5-Make sure that continuous monitoring and recording are carried out both during and after the removal of the ureteral stent. 6. Make sure the patient is adequately informed before being released. 7. Ensure each patient's safety on the trip out of the operating room. 8. Ensure that all employees (health team) uphold patient rights and ethical standards. 9-Make sure nurses adhere to professionalism. The nursing care requirements are in effect from January 15, 2022, until March 15, 2022.

#### **Statement of objectives used in the standards**

**General objectives:** These standards aimed to improve nurses' knowledge, practice and patients' outcomes regarding ureteral stent.

**Specific objectives:** At the end of applying these standards each nurse should be able to:

- Define ureteral stent and its purpose.
- Recognize the complications of ureteral stent.
- Identify the indications and contraindications for uses of ureter stent.
- Describe basic nursing competencies for patients undergoing ureteral stent management.
- List patient teaching.

#### **Ethical and Administrative considerations**

After receiving initial approval from the Ethics Committee of the Faculty of Nursing before beginning the study work and after being informed of its purpose, the medical director and head managers of the urology department and the urology outpatient clinic at Benha University Hospital granted official permission for data collection. Afterward, fully describing the study's goals, advantages, and data collection method to all participants (nurses and patients). The participants were informed that their participation was voluntary and they might revoke it at any moment without incurring any fees. Then, each nurse and

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patient enrolled in the research gave their verbal and written consent. All information gathered, according to the researchers, would be kept totally confidential and used solely for the research.

### **Preparatory phase**

During this stage, the relevant literature for various parts of the study was reviewed in order to create the right instruments for data collecting. The number of nurses and patients in the planned study environment had been evaluated at this phase. A pilot study marked the end of this stage.

**Tools validity:** Five experts, four in the field of medical surgical nursing from the nursing faculty at Benha University and a medical consultant in the field of urology from the faculty of medicine at Benha University, reviewed the face and content validity of the tools to assess the questions' relevance, clarity, accuracy, and applicability. Experts agreed on 98% of the items in the structured questionnaire for nurses, 99% of the items in the patients' evaluation interview questionnaire, and 99% of the items in the nurses' practice observational checklist. The same specialists also amended a nursing care standards handbook for ureteral stent management based on the most recent available literature. Subsequently, all necessary revisions were made, and the final version of the instrument was employed for data collection.

**Reliability of tools:** All tools of the study were tested statistically for its reliability, and it was evaluated using test-retest method by the Cronbach's alpha test which is used to measure the internal consistency. The reliability scores of the tools were r coefficient ( $r=0.83$ ) for tool I, ( $r=0.87$ ) for tool II and ( $r=0.93$ ) for tool III, which denotes the high internal consistency of the used tools.

**Pilot study:** To test the clarity and applicability of the study tools and the nursing care standards booklet, as well as to ascertain the time required to complete each tool and to identify any potential barriers that may prevent data collection, a pilot study was carried out on 10% of the study subjects (4 nurses and 8 patients). The required adjustments were made in order to have more suitable instruments for data collecting based on the results of the pilot research. The research subjects excluded the nurses or patients who were chosen for the pilot study. Two weeks before the study officially began, the pilot study was done.

**Data collection:** The data collection process and application of nursing care standards were carried out over a period of nine months beginning at January 2022 till the end of September 2022 (six months for enrollment of eligible subjects and three months for evaluating the

effect of nursing care standards after implementation). The study was carried out in the four phases listed below:

**Phase I: Assessment phase:** The researchers first gathered information about the personal information of each nurse under study, after which they used a questionnaire (Tool I) to gauge each nurses' knowledge of ureteral stent management, and an observational checklist (Tool II) to document each nurses' actions while caring for ureteral stent patients. Additionally, the researchers used the patients' evaluation interview questionnaire (Tool III) to evaluate the health outcomes of all the patients under study. Before implementing the nursing care standards for each nurse/patient separately, the researchers gathered the tools.

**Phase II: Planning phase:** Following the completion of the initial assessment, a nursing care standards were designed based on individual nurses' educational needs. The researchers set up teaching plan covering general and specific objectives. These standards were developed from recent relevant literatures, revised and modified based on the experts' comments, in order to be implemented using different methods. The standards resources and facilities were allocated (location and printed material or site of sessions that best serve the learners). The researchers determined the timetable of sessions with the nurses for starting nursing care standards sessions.

**Phase III: Nursing care standards implementation phase:** Three days a week, by rotation, the researcher was available for the morning shift at the clinical site. According to the nurses' needs, a time was set for the beginning of the educational and training sessions. The researcher separated the nurses under study into five groups, each with eight nurses, taking into account the timetable for their job. Five sessions were used to apply the nursing care standards material. It was divided into two theoretical sessions to learn the relevant information and three practical sessions where the standard steps of procedures were demonstrated and repeated under the supervision of researchers to give trainers confidence and ensure competence when applying the procedures for their patients. The length of the theoretical sessions and skill sessions varied from 45 to 60 minutes, includes discussion times based on the performance and input from the nurses. Each session began with a recap of the previous session's topics and a statement of the next session's goals. In order to increase the nurses' active engagement in instructional sessions, motivation and reinforcement were employed throughout the session. During the sessions, a variety of teaching and learning techniques were employed, including discussion, demonstration and re-demonstration, printed handouts with illustrations, and films. To aid in review and support instruction, the nursing care standards instructional colorful booklet was supplied to each participant in the study. It was written in understandable Arabic and enriched with

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images and examples to help the nurses better understand the subject. Each group participated in the subsequent sessions: **Theoretical sessions:** Were carried out in two sessions as follows:

- Session (1): Introduction to nursing care standards, explanation of general anatomy and physiology of the urinary system, discussion of ureteral obstruction, definition, function, indications, contraindications, and complications of ureteral stent.
- Session (2): This session contained information on stent replacement, side effects, and their understanding of stent removal, as well as the nurses' knowledge of patient instruction and information on after-stent instructions.

**Practical sessions:** Three sessions were held to cover the training part of nursing care of standardized steps to be followed during the application of the following procedure:

- Session (1): Applying pre-operative care and following infection control measures.
- Session (2): Nursing care during ureteral stent placement and after removal.
- Session (3): Postoperative criteria, continuous monitoring and recording are followed during ureteral stent placement and after removal (the nurses are follow professionalism).

**Phase IV: Evaluation phase:** The evaluation was conducted as soon as the nursing care standards were put into place using the same data collection tools as the pretest (post-test evaluation). Each nurse participating in the study was interviewed to assess their level of knowledge using tool I part 2, and the evaluation of their clinical practice was conducted using tool II. Additionally, tool III parts 3 and 4 were used to assess patients' results. The study patients were reevaluated by the researchers using the same data collection instruments one month after the introduction of nursing care guidelines. By contrasting the outcomes prior to, immediately following, and one month after the adoption of the standards, it was possible to assess the impact of the standards' implementation on the knowledge and practice levels of the nurses on patients' outcomes.

#### **Statistical analysis of the data:**

After collecting the data, variables in each data assessment tool were coded, scored manually, and transformed into specially designed form prior the entry of data. The collected data were tabulated and statistically analyzed using IBM SPSS (Statistical package for social science) statistical software version 25. Qualitative data were expressed as number and percent. Chi-square test was used to study the relation between qualitative variables, while quantitative data were presented as mean and standard deviation. For quantitative data, one way ANOVA test for repeated measures at different time intervals was done and F test for comparison between more than two groups. Paired t-test was utilized for pre-post

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comparison. Spearman's correlation coefficient was used to correlate between two distributed abnormally quantitative variables of the study. For interpretation of results of significance, non-significant was adopted at  $p > 0.05$ , significance was adopted at  $p \leq 0.05$ , and high significant was adopted at  $p \leq 0.001$ .

## Results

**Table (1)** shows that 67.5% of the studied nurses aged from 21 to less than 30 years old with Mean $\pm$ SD for the age was  $28.33 \pm 5.08$  years and 72.5% of them were females. As well, 65% of them were graduated from technical institute of nursing. While, 72.5% of them had 1 to less than 5 years of experience in urology specialty with Mean  $\pm$ SD =  $6.80 \pm 4.22$ . Moreover, 90% had not attended any previous training courses regarding ureteral stent management.

**Table (2)** shows that all the studied nurses 100% had unsatisfactory knowledge about ureteral stent management before receiving the nursing care standards. While, immediate post nursing standards their level of knowledge improved significantly to satisfactory level in all knowledge items to (90%, 100%, 97.5%, 77.5% and 100%) respectively. But after one month follow up slight decline in level of knowledge was observed to (82.5%, 95%, 92.5%, 75% and 97.5%) respectively. Furthermore, there were high statistically significance regarding the overall knowledge items between pre and immediate post and between pre and post one month follow up of the nursing care standards implementation at ( $p \leq 0.001^{**}$ ). While, there was no statistically significant difference in total score of nurses' knowledge between immediate post and after one month follow up of nursing standards implementation at ( $p > 0.05$ ).

**Table (3)** shows that percentage of adequate practice of the studied nurses that followed nursing care standards steps in all practice items at pre implementation of the program (12.5%, 22.5%, and 17.5% respectively), which improved significantly immediate post nursing standards to become (100%, 95%, and 90% respectively), While, post one month follow up slight decline in an adequate level of practice was observed to (97.5%, 92.5%, and 85% respectively). In addition, there were high statistically significance regarding the overall practice of nurses performed in the previously mentioned procedures items between pre and immediate post and between pre and post one month follow up of the nursing care standards implementation at ( $p \leq 0.001^{**}$ ). While, there was no statistically significant difference in total score of nurses' practice between immediate post and after one month follow up of nursing care standards implementation at ( $p > 0.05$ ).

**Table (4)** shows statistically significant relation between mean total knowledge score and their sex during pre-nursing standards implementation ( $p = 0.025^*$ ), as well as, there was

statistical significant relation between total nurses' knowledge mean score and their education qualification in pre, immediate post nursing standards and after one month of nursing standards implementation ( $p=0.058^*$ ,  $p= 0.040^*$ ,  $p=0.048^*$  respectively). While, there was no statistically significant relation between total nurses' knowledge mean score and their age, and experience years throughout the nursing care standards phases at ( $P= > 0.05$ ). Also the table demonstrates that nurses who were more than 40 years had significantly the greatest mean total knowledge score, the more experienced the nurses, the significance greater mean total knowledge score they had and nurses who had postgraduate studies in nursing, had more mean total knowledge score than who had other nursing education qualification.

**Table (5)** shows relation between overall nurses' practice mean score and their personal data throughout the nursing care standards phases. The table demonstrates statistically significant relation between total nurses' practice mean score and their education qualification in immediate post nursing care standards ( $p<0.05^*$ ). While, there was no statistically significant relation between total nurses' practice mean score and their age, sex, and experience years throughout the nursing care standards phases at ( $P= > 0.05$ ). Also the table illustrates that nurses who were more than 30 years had significantly the greatest mean total practice score, the more experienced the nurses, the significance greater mean total practice score they had and the nurses who had postgraduate studies in nursing, had more mean total practice score than who had other nursing education qualification.

**Table (6)** shows that 59.7% of the studied patients aged from 41 to 50 years old with Mean $\pm$ SD for the age was  $45.38 \pm 10.63$  years and 80.6 & 84.7% of the studied patients were married males respectively, as well, 73.6% of them had intermediate education, 77.8% were workers, and 75% of them reported had manual work and 81.9% resided in rural areas.

**Table (7)** shows that 70.8% of the studied patients had ureteral stone, and 45.8% of patients didn't have any chronic disease, diabetes mellitus were prevailing among 22.2% followed by 13.9 % of them had hypertension, as well, 43.1% of patients had lesions on both sides of the ureter, 44.4% of the stone affected patients had the stone of 1 mm size. Regarding the type of ureteral stent, it was observed that 66.7% of them insert double –J design.

**Table (8)** shows that mean total ureteral stent symptoms score pre was  $70.42\pm 8.017$ , significantly decreased (improved) to  $42.36\pm 8.106$  immediate post, and  $32.49\pm 13.39$  post one month of implementing the nursing care standards ( $P < 0.001$ ).

**Table (9)** shows that a significant decrease in the mean total ureteral stent discomfort test score immediate post  $40.36 \pm 6.24$ , and post one month of implementing the nursing care standards  $3.34 \pm 3.41$  compared to  $56.12 \pm 3.93$  pre-implementation ( $P < 0.001$ ).

**Table (10)** shows the correlation between the total mean score of knowledge, the total mean of practice among the studied nurses and total mean of ureteral stent symptoms and discomfort test score among the studied patients, there was significant statistical correlation between nurses' knowledge, practice and total ureteral stent symptoms and discomfort of the studied patients pre implementation of nursing standards  $p < 0.001$ . Also, there was significant statistical negative correlation between total nurses' knowledge, practice and ureteral stent symptoms of the studied patients at immediate post and after one month of implementation of the nursing standards ( $r = 0.214, -0.413$  &  $-0.404$  at  $p = .014, p = .000$  &  $p = .000$  respectively) and ( $r = 0.226, -0.427$  &  $-0.419$  at  $p = .012, p = .000$  &  $p = .000$  respectively). This table also shows significant statistical negative correlation between total nurses' knowledge, practice and ureteral stent discomfort of the studied patients at immediate post and after one month of implementation of the nursing standards ( $r = 0.213, -0.314$  &  $-0.303$  at  $p = .012, p = .000$  &  $p = .000$  respectively) and ( $r = 0.215, -0.416$  &  $-0.318$  at  $p = .014, p = .000$  &  $p = .000$  respectively).

**Table (1): Frequency and percentage distribution of the studied nurses according to their personal data (n=40).**

Nurses' personal data	Total (n=40)	
	Number N	Percent %
<b>Age ( in year)</b>		
21 < 30	27	67.5
30 < 40	8	20
40- ≤ 50	5	12.5
<b>Mean ± SD = 28.33 ± 5.08years</b>	<b>Min = 23years,</b>	<b>Max = 50 years</b>
<b>Sex</b>		
Male	11	27.5
Female	29	72.5
<b>Education qualification</b>		
Nursing Diploma	7	17.5
Technical Nursing Institute	26	65.0
Bachelor 's degree	5	12.5
Postgraduate studies	2	5.0
<b>Experience Years</b>		
<1	3	7.5
1- <5	29	72.5
5- <10	6	15.0
≥ 10	2	5.0
<b>Mean ± SD = 6.80 ± 4.22</b>	<b>Min = 1years,</b>	<b>Max = 13 years</b>
<b>Previous training courses regarding ureteral stent management</b>		
Yes	4	10.0
No	36	90.0

**Table (2): Frequency and percentage distribution of total nurses' knowledge score pre and post implementing the nursing care standards (n=40).**

Nurses' knowledge items	Total (n=40)												Chi square (p-value) (1)	Chi Square (p-value) (2)	Chi Square (p-value) (3)
	Pre nursing care standards				Immediate post nursing care standards				One month post nursing care standards						
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory				
	N	%	N	%	N	%	N	%	N	%	N	%			
Knowledge regarding general information about ureteral stent	0	0.0	40	100	36	90	4	10	33	82.5	7	17.5	X <sup>2</sup> =96.27 P =.001**	X <sup>2</sup> =87.74 P =.001**	X <sup>2</sup> =0.696 P =.409 n.s
knowledge about ureteral stent complications	0	0.0	40	100	40	100	0	0.0	38	95	2	5	X <sup>2</sup> =75.32 P =.001**	X <sup>2</sup> =58.43 P =.001**	X <sup>2</sup> =.602 P =.402 n.s
Nursing care for patients with ureteral stent	0	0.0	40	100	39	97.5	1	2.5	37	92.5	3	7.5	X <sup>2</sup> =96.28 P =.001**	X <sup>2</sup> =87.34 P =.001**	X <sup>2</sup> =0.570 P =0.413 n.s
Patient teaching about ureteral stent	0	0.0	40	100	31	77.5	9	22.5	30	75	10	25	X <sup>2</sup> =63.60 P =.001**	X <sup>2</sup> =57.04 P =.000**	X <sup>2</sup> =0.617 P =0.432 n.s
Knowledge regarding stent removal	0	0.0	40	100	40	100	0	0.0	39	97.5	1	2.5	X <sup>2</sup> =64.60 P =.001**	X <sup>2</sup> =56.04 P =.001**	X <sup>2</sup> =0.619 P =0.436 n.s
<b>Total knowledge score</b>	8	20	32	80	35	87.5	5	12.5	34	85	6	15	X <sup>2</sup> =51.98 P =.001**	X <sup>2</sup> =48.44 P =.001**	X <sup>2</sup> =0.267 P =.0.591 n.s
	F= 0.002												p-value = ≤ 0. 001 **		

(n.s) not significant

(\*\*) Highly statistically significant at ≤0.001

(1) X<sup>2</sup>1 Difference in total knowledge score between pre and immediate post nursing care standards implementation.

(2) X<sup>2</sup>2 Difference in total knowledge score between pre and one month post nursing care standards implementation.

(3) X<sup>2</sup>3 Difference in total knowledge score between immediate post and one month post nursing care standards implementation

F (one way ANOVA test) used to differentiate between level of knowledge regarding ureteral stent management pre, immediate post and after one month implementation of the nursing care standards.



**Table (3): Frequency and percentage distribution of total nurses' practice score pre and post implementing the nursing care standards (n=40).**

Nurses' practice	Total (n=40)												Chi square (p-value) (1)	Chi Square (p-value) (2)	Chi Square (p-value) (3)
	Pre nursing care standards				Immediate post nursing care standards				One month post nursing care standards						
	Adequate		Inadequate		Adequate		Inadequate		Adequate		Inadequate				
	N	%	N	%	N	%	N	%	N	%	N	%			
Pre-operative care & following infection control measures	5	12.5	35	87.5	40	100	0	0.0	39	97.5	1	2.5	X <sup>2</sup> =92.86 P=.001**	X <sup>2</sup> =89.98 P=.001**	X <sup>2</sup> =1.00 P=.12 n.s
Nursing care during ureteral stent placement and after removal	9	22.5	31	77.5	38	95	2	5	37	92.5	3	7.5	X <sup>2</sup> =78.92 P=.001**	X <sup>2</sup> =68.42 P=.001**	X <sup>2</sup> =0.38 P=.55 n.s
Postoperative criteria, continuous monitoring & the nurses are follow professionalism	7	17.5	33	82.5	36	90	4	10	34	85	6	15	X <sup>2</sup> =57.79 P=.001**	X <sup>2</sup> =52.85 P=.001**	X <sup>2</sup> =0.12 P=.74 n.s
<b>Total practice score</b>	6	15	34	85	37	92.5	3	7.5	36	90	4	10	X <sup>2</sup> =67.70 P=.001**	X <sup>2</sup> =65.48 P=.001**	X <sup>2</sup> =0.110 P=.72 n.s
	<b>F= 0.005</b>												<b>p-value = ≤ 0.001 **</b>		

(n.s) Not significant (\*) Statistically significant at ≤0.05 (\*\*) Highly statistically significant at ≤0.001

(1) X<sup>2</sup>1 Difference in total practice score between pre and immediate post nursing care standards implementation.(2) X<sup>2</sup>2 Difference in total practice score between pre and one month post nursing care standards implementation.(3) X<sup>2</sup>3 Difference in total practice score between immediate post and one month post nursing care standards implementation

F (one way ANOVA test) used to differentiate between level of practice regarding ureteral stent management pre, immediate post and after one month implementation of the nursing care standards.

**Table (4): Relation between mean total knowledge score of studied nurses with their personal data (n=40).**

Nurses' personal data	Pre nursing standards	Test of Sign.	P-Value	Immediate post nursing standards	Test of Sign	P-Value	One month post nursing standards	Test of Sign	P-Value
	Mean ± SD			Mean ± SD			Mean ± SD		
<b>Age</b>									
21 < 30	5.33 ± 4.56	F=0.658	.452	17.09 ± 3.05	F=0.734	.408	17.109 ± 4.19	F=0.025	.979
30 < 40	7.26 ± 2.07			18.36 ± 2.13			18.134 ± 4.70		
40- ≤ 50	8.35 ± 4.61			19.19 ± 2.11			19.595 ± 3.96		
<b>Sex</b>									
Male	7.44 ± 4.7	t=2.307	.025*	18.94 ± 2.78	t=0.049	.962	19.056 ± 2.51	t=1.115	.267
Female	4.61 ± 4.18			18.905 ± 2.93			17.714 ± 4.81		
<b>Education qualification</b>									
Nursing Diploma	8.200 ± 5.35	F=2.64	0.058*	16.4000 ± 5.19	F=2.95	0.040*	11.5000 ± 8.16	F=2.85	0.048*
Technical Nursing Institute	9.200 ± 6.76			17.6000 ± 2.61			10.733 ± 6.017		
Bachelor 's degree	13.900 ± 8.69			18.83 ± 3.09			14.8000 ± 7.01		
Postgraduate studies	15.133 ± 6.65			19.400 ± 2.92			17.1333 ± 6.06		
<b>Experience Years</b>									
<1	6.25 ± 4.62	F=0.109	.897	17.81 ± 3.32	F=0.828	.443	15.917 ± 4.10	F=.529	.529
1 - <5	6.72 ± 3.34			17.500 ± 1.72			16.889 ± 3.63		
5 < 10	8.00 ± 7.16			18.83 ± 2.56			17.000 ± 7.01		
≥ 10	9.25 ± 2.05			19.19 ± 2.109			18.625 ± 4.96		

F (one way ANOVA test)

t (independent test)

**Table (5): Relation between mean total practice score of studied nurses with their personal data (n=40).**

Nurses' personal data	Pre nursing standards	Test of Sign.	P-Value	Immediate post nursing standards	Test of Sign	P-Value	One month post nursing standards	Test of Sign	P-Value
	Mean ± SD			Mean ± SD			Mean ± SD		
<b>Age</b>									
21 < 30	25.76± 4.87	F=1.649	.619	117.41± 3.38	F=0.748	.458	114.9 ± 8.58	F=0.245	.809
30 < 40	26.79± 3.57			118.64 ± 3.37			115.29± 7.87		
40- ≤ 50	26.80 ± 4.39			118.95± 3.03			116.59 ± 9.48		
<b>Sex</b>									
Male	26.94± 6.25	t=.0888	.385	118.00± 4.14	t=0..349	.728	114.78 ± 9.59	t=.597	.553
Female	25.55± 3.57			118.33± 3.02			116.19 ± 7.85		
<b>Education qualification</b>									
Nursing Diploma	43.40 ± 40.66	F=2.30	0.087	116.40± 2.70	F=2.50	0.05*	57.53± 4.47	F=2.08	0.06
Technical Nursing Institute	50.33± 41.88			117.20 ± 3.29			74.60 ± 48.74		
Bachelor 's degree	74.50±49.34			118.300± 3.76			90.17± 40.51		
Postgraduate studies	87.27± 44.65			119.60 ± 2.68			94.60 ± 39.20		
<b>Experience Years</b>									
<1	24.78± 3.92	F=1.887	.161	117.33 ± 3.66	F=0.060	.942	114.08 ± 8.53	F=.196	.824
1 - <5	25.2 ± 5.69			118.00± 3.24			114.78 ± 9.43		
5 < 10	26.80 ± 4.39			118.95± 3.04			11579 ± 9.48		
≥ 10	27.17 ± 3.06			119.33±1.96			116.83 ± 2.41		

F (one way ANOVA test)

t (independent test)

(\*) Statistically significant at ≤0.05

(\*\*) Highly statistically significant at ≤0.001

**Table (6): Frequency and percentage distribution of the studied patients according to their personal data (n=72).**

Patients' personal data	Studied patients (n=72)	
	Number (N)	Percent (%)
<b>Age ( years)</b> 20- ≤ 40 41- ≤ 50 51- ≤ 60	9 43 20	12.5 59.7 27.8
<b>Range</b> <b>Mean ± SD</b>	<b>23.0-60.0 years,</b> <b>45.38 ± 10.63 years</b>	
<b>Sex</b> Males Females	61 11	84.7 15.3
<b>Marital status</b> Married Not married	58 14	80.6 19.4
<b>Education level</b> Illiterate Read & Writes Intermediate education University education	2 4 53 13	2.8 5.6 73.6 18.0
<b>Occupation</b> Working Not working	56 16	77.8 22.2
<b>If yes, what is the nature of work? (n=56)</b> Office work Manual work	14 42	25 75
<b>Place of residence</b> Urban Rural	13 59	18.1 81.9

**Table (7): Frequency and percentage distribution of the studied patients according to their medical history and stent-related data (n=72).**

Patients' medical history & and stent-related data	Studied patients (n=72)	
	Number (N)	Percent (%)
<b>Medical diagnosis</b>		
Ureter stone	51	70.8
Ureter tumor	14	19.5
Congenital anomalies in kidney or ureter	7	9.7
<b>Chronic disease</b>		
Diabetes mellitus	16	22.2
Hypertension	10	13.9
Heart disease	7	9.7
Liver disease	2	2.8
Blood circulation disturbance	4	5.6
None	33	45.8
<b>Lesion site</b>		
The right-side ureter	8	11.1
The left side ureter	11	15.3
Both sides of the ureter	31	43.1
The kidneys	22	30.5
<b>Stone size</b>		
1 mm	32	44.4
2 mm	13	18.1
8 mm	6	8.3
10 mm	21	29.2
<b>Mean ± SD</b>	<b>2.74± 0.82</b>	
<b>Types of ureteral stents</b>		
Double -J (JJ)	48	66.7
Double-J 3D	19	26.4
Other	5	6.9

**Table (8): Differences of mean total ureteral stent symptoms score among studied patients pre, immediately post, and after one month of implementing the nursing care standards (n = 72).**

Items of USSQ	Pre nursing standards	Immediate post nursing standards	One month post nursing standards	T-test (1)	P-Value	T-test (2)	P-Value
	Mean ± SD	Mean ± SD	Mean ± SD				
Urinary symptoms	20.31±3.76	15.00±5.83	12.645±11.81	20.91	<0.001**	15.300	<0.001**
Pain	14.059±2.14	10.23±3.79	7.90±1.021	14.812	<0.001**	22.718	<0.001**
General health	13.85±2.19	8.74±2.72	6.740±1.52	22.29	<0.001**	32.228	<0.001**
Work performance	11.78±1.89	6.88±2.109	2.76±1.229	22.437	<0.001**	31.017	<0.001**
Sexual matters	12.72±2.016	3.43±2.108	2.39±1.28	37.376	<0.001**	41.229	<0.001**
<b>Total</b>	70.42±8.017	42.36±8.106	32.49±13.39	41.109	<0.001**	34.46	<0.001**

(\*) Statistically significant at  $\leq 0.05$

(\*\*) Highly statistically significant at  $\leq 0.001$

(1) Difference between the level of USSQ pre & immediately post nursing care standards implementation,

(2) Difference between the level of USSQ pre & post one month of implementing the nursing care standards.

**Table (9): Differences of mean total ureteral stent discomfort test score among studied patients pre, immediately post, and after one month of implementing the nursing care standards (n = 72).**

Items of urinary discomforts	Pre nursing standards	Immediate post nursing standards	One month post nursing standards	T-test (1)	P-Value	T-test (2)	P-Value
	Mean ± SD	Mean ± SD	Mean ± SD				
Feel of not emptying the bladder.	5.68±0.55	4.12±0.80	0.41±0.56	31.41	<0.001**	71.56	<0.001**
Had a burning sensation during Urination	4.97±0.67	3.56±0.58	0.21±0.64	42.67	<0.001**	94.16	<0.001**
Found it difficult to postpone urination.	4.47±0.61	3.14±0.94	0.27±0.59	39.36	<0.001**	90.29	<0.001**
Urinate less frequently than every two hours.	6.74±0.77	3.27±0.67	0.53±0.68	35.34	<0.001**	86.94	<0.001**
Had urine leakage	4.59±0.56	3.21±0.56	0.25±0.44	46.06	<0.001**	83.65	<0.001**
Observed blood in urine	4.57±0.55	3.26±0.49	0.18±0.35	44.64	<0.001**	68.89	<0.001**
Had lower abdominal pain (suprapubic region)	2.82±0.29	1.70±0.58	0.17±0.30	23.52	<0.001**	81.16	<0.001**
Had lower back pain (lumbalgia).	2.67±0.22	1.89±0.52	0.21±0.41	27.22	<0.001**	64.81	<0.001**
The ureteral stent made you unable to walk, do exercise, or perform daily activities	4.51±0.62	3.35±0.69	0.16±0.42	45.02	<0.001**	71.39	<0.001**
Since ureteral stent placement, experienced pain or discomfort during sexual intercourse.	4.60±0.61	3.12±0.71	0.20±0.43	42.29	<0.001**	74.83	<0.001**
Since ureteral stent placement, had to take an analgesic or pain medication to lessen the discomfort from the ureteral stent.	4.49±0.51	3.19±0.26	0.15±0.39	46.16	<0.001**	73.37	<0.001**
The ureteral stent negatively affected the daily life	4.52±0.54	3.90±0.22	0.18±0.44	8.35	<0.001**	78.42	<0.001**
Since ureteral stent placement, had to see a physician or go to the emergency room due to the discomfort from the ureteral stent.	4.65±0.56	3.32±0.61	0.18±0.37	43.57	<0.001**	82.11	<0.001**
<b>Total</b>	56.12±3.93	40.36±6.24	3.34±3.41	62.93	<0.001**	114.06	<0.001**

(\*) Statistically significant at  $\leq 0.05$

(\*\*) Highly statistically significant at  $\leq 0.001$

(1) Difference between the urinary discomfort pre & immediately post nursing care standards implementation,

(2) Difference between the urinary discomfort pre & post one month of implementing the nursing care standards.

**Table (10): Correlation between total nurses' knowledge, practice at pre, immediate post, after one month of implementing the nursing care standards and total ureteral stent symptoms and discomfort test of the studied patients.**

Variables		Total ureteral stent symptoms questionnaire			Total ureteral stent discomfort test		
		Pre nursing standards	Immediate Post nursing standards	One month post nursing standards	Pre nursing standards	Immediate Post nursing standards	One month post nursing standards
Total nurses' knowledge	r	0.214	-0.413	-0.404	0.213	-0.314	-0.303
	p	.014*	.000**	.000**	.012*	.000**	.000**
Total nurses' practice	r	0.226	-0.427	-0.419	0.215	-0.416	-0.318
	p	.012*	.000**	.000**	.014*	.000**	.000**

## Discussion

Placement of ureteral stents, a frequent minimally invasive surgery used to treat obstructive uropathy and preserve ureteral patency, has been linked to problems and decreased patient function in general (2). The renal nurses caring for these patients need specialized knowledge and experience to decrease difficulties through prevention or anticipation and early intervention to enhance the patients' outcomes (7). This is because it is the role of renal nurses in partnership with physicians. The present study aimed to evaluate the effect of developing and implementing nursing care standards on patients' outcomes regarding ureteral stent.

Regarding the personal information of the nurses under study, the findings of the current study revealed that more than two thirds of the nurses under study were between the ages of 21 and less than 30 years, with a mean age of 28.33 5.08 years. According to the researchers, this result may be attributable to the fact that the majority of young aged nurses are capable of effectively providing direct care for these patients, while the higher age groups of nurses have managerial roles. This conclusion is consistent with research conducted by **Badawy et al., (2019)**<sup>(3)</sup> about "Effect of nursing staff development regarding ureteral stent management on nurses' knowledge and practice" revealed that, about half of studied nurses were in the age group of 26-< 30 years followed by 34.2% in the age group of 21-<26 years. Also, this result was agreed with **Abdelbaky et al., (2018)**<sup>(12)</sup> who stated in their study entitled "Impact of simulated education program on nurses' performance of invasive procedure: Evidence based practice" who highlighted that the majority of the nurses studied were between the ages of 20 and 30. But this result was incongruent with **Liyew et al., (2020)**<sup>(13)</sup> who conducted a study entitled "Nurses' knowledge, attitude, and



influencing factors regarding ureteral stent management " mentioned that, majority of their studied nurses' age were above the age of 35 years old.

In terms of sex, the present study's findings revealed that around 75 percent of the nurses were female. The long-held belief that nursing is only a career for women and that men have just lately learnt the profession may be the cause of this; in Egypt, prior to that time, most nursing students were female. This outcome is consistent with **Mohammed et al., (2016)**<sup>(15)</sup> who made a study about "Impact of designed nursing educational protocol on health promotion for patients undergoing coronary artery stent outcome" mentioned that, the majority of the sample were females. Also, similar finding was founded by **AbdElbaky et al., (2018)**<sup>(12)</sup> who indicates that the majority of their participants were females. This result, however, contradicts a study conducted by **Bostanci et al., (2020)**<sup>(8)</sup> about "Clinical effectiveness of single pigtail suture stent on patient comfort" reported that, the majority of studied nurses were males.

In terms of educational background, the current study found that roughly two-thirds of the examined nurses had graduated from a technical nursing institute. This finding can be explained by the fact that Benha University has multiple nursing technical institutes, each of which enrolls a sizable number of students who eventually pass out after two years. As a result, more nurses graduated from the technical nursing institution than from nursing schools that offered bachelor's degrees or other nursing-related degrees. This outcome is congruent with research done by **Gaballah & EL-Deen (2021)**<sup>(16)</sup> titled "Effect of developing and implementing nursing care standards on outcome of patients with ureteral stent" who reported that nearly two thirds of the studied nurses were graduated from technical institute of nursing. Also, similar finding was founded by **AbdElbaky et al., (2018)**<sup>(12)</sup> who stated that the majority the studied subjects' were graduated from technical institute of nursing. But **Bostanci et al., (2020)**<sup>(8)</sup> disagree with the results of the present study and reported in their study that sixty-five percent of nurses achieved bachelor's degree in nursing.

The majority of the studied nurses were recently graduated, and the years of experience they have are consistent with their ages. As for the studied nurses' years of experience, the current study revealed that about three-quarters of the nurses reported having one to less than five years of experience in the urology specialty. If they are not supported by continued educational programs to better them, the loss in experience years will negatively affect their performance, which will eventually affect how they give patient care. This outcome was consistent with **Badawy et al., (2019)**<sup>(3)</sup> who reported that that the majority of the nurses had 1 – 5 years of clinical experience. On the other hand, this finding is in contrast with **Liyew et al., (2020)**<sup>(13)</sup> mentioned in their study that more than two-third of nurses had an experience of more than 10 years.

According to the current study's findings, the majority of the nurses who were evaluated had not previously participated in any training programs for managing ureteral stents. This finding may be explained by the fact that the majority of nurses are too busy with their daily duties to attend any training sessions, and that the hospital did not have any training sessions specifically geared at managing ureteral stents due to nurses' lack of interest. This outcome was consistent with **Liyew et al., (2020)**<sup>(13)</sup> illustrates that most of study nurses not having training about ureteral stent management. Also the finding is supported with **Mohammed et al., (2016)**<sup>(15)</sup> who revealed that nearly all of study nurses were not participating in the training sessions related to care of patients with ureteral stent.

The current study shown that all the investigated nurses had inadequate understanding about ureteral stent management prior to acquiring the nursing care standards. This was in connection to the overall nurses' knowledge level about ureteral stent management. However, with the implementation of nursing standards, their level of knowledge rapidly increased to a satisfactory level across the board. However, there was a modest reduction in knowledge level after a month of follow-up. Additionally, there was strong statistical significance in relation to the total knowledge items between pre and immediately after the adoption of the nursing care standards and between pre and post one month follow up. The total score of nurses' knowledge did not significantly change between the immediate post-implementation and one-month follow-up of the nursing standards. Researchers believe that newly graduated nurses treat patients in accordance with their prior academic studies and without having a chance to learn about the optimum nursing care standards pertaining to the treatment of patients with ureteral stents. Additionally, this improvement was strongly linked to greater familiarity and understanding of the nursing care standards, reinforcement of sessions, and the successful use of multiple media, such as a colorful booklet and a laptop, to increase clarification and understanding. Additionally, this improvement can be explained by the fact that all nurses were young, a time when people are often open to learning new things. Attending training sessions on the management of patients with ureteral stents also helps nurses learn more about how to deliver safe care and minimize potential consequences. The research's initial premise is supported by these findings.

This is congruent with a previous study done by **Nakadk and Patel, (2020)**<sup>(4)</sup> about "Placement and management of indwelling ureteral stents" showed that improved knowledge level of nurses regarding ureteral stents management. In similarity, **Badawy et al., (2019)**<sup>(3)</sup> reported that all their studied nurses had lower level of knowledge at the pre-nursing standards phase. But after the application of the nursing standards their knowledge mean score was significantly improved at the post and follow up of the standards phases. On the other hand, this finding is in contrast with a study done by **Ahmed et al., (2022)**<sup>(17)</sup> about "A model to describe the relationship between knowledge, skill, and judgment in

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nursing practice" mentioned that studied nurses had fairly good knowledge level about application of nursing standards post- program implementation .This difference may be attributed to that majority of nurses in this part acquire their knowledge from their basic educational programs, or from hospital policies and procedures.

As to total nurses' practice level related to pre-operative care & following infection control measures, nursing care during ureteral stent placement and after removal, postoperative criteria, continuous monitoring & the nurses are follow professionalism; the current study results found that less than quarter of the studied nurses had an adequate level of practice was observed of the studied nurses that followed nursing care standards steps in all practice items at pre implementation of the program, which significantly improved to adequate level of all practice in the same items immediate post program. While a minor drop in an acceptable level of practice was seen after a one-month follow-up. Additionally, there was strong statistical significance in relation to how nurses generally practiced the aforementioned procedural items between pre and immediately after introduction of the nursing care standards and between pre and post one month follow up. A month following the adoption of the nursing care standards, there was no statistically significant difference in the overall score of nurses' practice between the two time points. This may be the result of a lack of training programs on how to follow nursing care standards while caring for patients with ureteral stents and the efficiency of implementing nursing care standards to improve nurses' practices throughout the phases of standards. Additionally, abilities may be developed with ease, especially if they are connected to their pertinent scientific underpinnings. The second research hypothesis is supported by these findings.

These results are the same line with **Badawy et al., (2019)**<sup>(3)</sup> emphasized the same results in their study that mean post-test scores for practice of nursing care standards were significantly higher than the mean pre test scores. This result also comes in agree with a study by **Gaballah and EL-Deen, (2021)**<sup>(16)</sup> showed that an improvement in nurses' practice after the attendance of continuing nursing education sessions. Similar finding was reported by **Mohammed et al., (2016)**<sup>(15)</sup> they stated that the in service training program has a beneficial effect on improving nurses' knowledge and skills. They also recommended the organization of educational programs according to the need of nurses with continuous evaluation. Also, another study conducted by **Liyew et al., (2020)**<sup>(13)</sup> showed that all nurses had unsatisfactory practice regarding care of patients with ureteral stent before teaching program intervention, while all of them had satisfactory practice after teaching program intervention, and also demonstrated that training may have a beneficial influence on increasing nurses' abilities to care for subjects with ureteral stents, as seen by improvements in knowledge, practice, and attitudes post-training. Contrarily with this finding a study done by **Ahmed et al., (2022)**<sup>(17)</sup> reported that nursing care standards program have no effect on nurses' practice scores after implementation of the standards. This contradiction may be

explained by this study application of nursing care standards for a short period of time and this period not enough for improvement of nurses' practice.

Regarding the relationship between the average total knowledge score of the examined nurses and their personal information over the course of the nursing care standards phases, the current study's findings showed a statistically significant positive relationship between the average total knowledge score and their sex during the pre-implementation of the nursing care standards as well as a statistically significant positive relationship between the average total knowledge score of the studied nurses and their educational background in the pre implementation phase throughout the phases of the nursing care standards, there was no statistically significant relationship between the mean score for all nurses' knowledge and their age or years of experience. Additionally, it was discovered that nurses with more than 40 years of experience had significantly higher mean total knowledge scores than nurses with less experience, and that nurses with postgraduate nursing degrees had significantly higher mean total knowledge scores than nurses with other nursing education credentials. This is consistent with **Ahmed et al., (2022)**<sup>(17)</sup> who reported that professional education level of nurses showed great impact on their knowledge. Also, these findings of study supported by **Badawy et al., (2019)**<sup>(3)</sup> documented that increasing age and experience of studied nurses have an effect on their knowledge. In addition, **Liyew et al., (2020)**<sup>(13)</sup> stated that there was statistically relation between total nurses' knowledge with only their qualification post the nursing intervention guidelines implementation training course. This was inconsistent with **Gaballah and EL-Deen, (2021)**<sup>(16)</sup> who revealed that nurses' age had no effect on their knowledge and practice improvements. Furthermore, emphasized in their study that only nurses' experience had an effect on nurses' knowledge and practice improvements.

The current study's findings revealed a statistically significant positive relationship between the mean total practice score of the nurses under study and their educational background in the immediate post-nursing care standards. This relationship was seen throughout the phases of the nursing care standards. Throughout the nursing care standards stages, there was no statistically significant relationship between the mean score for all nurses' practice and their age, sex, or years of experience. Additionally, the current study highlighted that nurses with more than 30 years of experience had significantly higher mean total practice scores than nurses with less experience did, and that nurses with postgraduate nursing degrees also had significantly higher mean total practice scores. The recognized fact that empowered nursing care standards education is a model created for in-service training for nurses that recommends matching the training programs according to educational needs connected to practical skills for nursing staff may help to explain this. Nursing care guidelines that were empowering let nurses carry out their professional duties accurately and competently. These outcomes were validated by **AbdElbaky et al.,**

(2018)<sup>(12)</sup> who mentioned in their study that there was highly statistically significant relation between nurses' qualification and their practices. Also, these results agreed with **Ahmed et al., (2022)**<sup>(17)</sup> who reported that years of experience had no effect on the nursing performance. On contrary, **Bostanci et al., (2020)**<sup>(8)</sup> who founded that there was no statistically relation between nurses' practices with their educational level. Also, **Liyew et al., (2020)**<sup>(13)</sup> emphasized in their study that there was negative statistically relation between nurses' educational level and nurses' practices.

Regarding studied patients' personal data; the results of the current study reported that nearly three fifths of the studied patients aged from 41 to 50 years old with Mean±SD for the age was  $45.38 \pm 10.63$  years, the reason for this may be related to the fact that prevalence of urinary stones formation increased with aging. This finding is in line with a study carried out by **Rashid and Yahya (2018)**<sup>(18)</sup> about "Percutaneous nephrolithotomy in obese patients is there any challenge?" mentioned that, stones affect people in the peak age at onset from 40-59 years old. Also, this result was consistent with **Luckman et al., (2019)**<sup>(19)</sup> in their book about "Medical surgical nursing, psychophysiological approach" stated that, early middle adulthood between the 20-50 years old urinary stones occurred. But this result was incongruent with study done by **Tewfik and Bagely (2019)**<sup>(20)</sup> about "Management of upper urinary tract calculi with ureteroscopic techniques" who reported that, stones affect people in the peak age at onset from 20 - 30 years old. This may be attributed to people depend on delivery and fast food in this age.

The present study's findings regarding patients' sex revealed that most of the patients were married men. The cause of this may be related to the anatomical difference between men and women, in which the male urethra is longer than the female urethra, which may cause accumulation and stagnation of urine in the bladder for longer periods of time. Another cause of this may be related to the lower serum testosterone level, which may contribute to the protection factor for women against oxalate stone disease and increased urinary citrate concentrations. This finding supports **Raja et al., (2020)**<sup>(21)</sup> about "The impact of urinary stone disease and their treatment on patients' quality of life" reported that, more than half of studied patients were males.

According to the present findings, the majority of the researched patients—nearly three quarters—had intermediate education, and the majority of them lived in rural regions. This outcome may be explained by the patients' rural residences and the physical proximity of Benha University Hospital to patients from rural regions. The same result was disclosed by **Ahmed et al., (2022)**<sup>(17)</sup> who found that the more than half of studied patients had intermediate qualification.

As regards to occupation, the findings of the present study revealed that more than three quarters of the studied patients were worker and three quarters of them reported had manual work. This is congruent with **Bostanci et al., (2020)**<sup>(8)</sup> reported that, more than half of the total subjects were worker.

Regarding the medical histories and stent-related information of the patients under study, the current study showed that more than two-thirds had ureteral stones, less than half had any chronic diseases, and less than a quarter of them had diabetes mellitus, followed by less than a fifth who had hypertension. Additionally, less than half of the patients had lesions with stone lesions measuring 1 mm on both sides of the ureter. Additionally, two-thirds of them implanted double-J stents of the size. This outcome supports **Ramirez et al., (2019)**<sup>(5)</sup> about "Development and validation of the ureteral stent discomfort test (USDT)" documented that three fifths of male patients underwent JJ stent insertion. On the opposite side a study was done by **Nestler et al., (2020)**<sup>(14)</sup> about "Size does matter: Ureteral stents with a smaller diameter show advantages regarding urinary symptoms, pain levels and general health" showed that a total of eighty-five adult patients with unilateral indwelling ureteral stents do not have JJ stent insertion.

The current study's findings regarding the mean total ureteral stent symptoms score revealed that there was a reduction in the mean total score of ureteral stent symptoms (including urinary symptoms, pain, general health, work performance, and sexual matters) prior to, immediately after, and one month after the implementation of the nursing care standards. This could be explained by the fact that education is the key to successfully managing a patient with a stent; minimizing its effects and providing an aesthetic This outcome is consistent with research conducted by **Bosio et al., (2021)**<sup>(22)</sup> about "Pigtail suture stents significantly reduce stent-related symptoms compared to conventional double J stents" stated that stented patients have functional impairment in many aspects of everyday life, including general health, pain, urinary tract symptoms, and hematuria are frequent and sexual function. Also, the USSQ is the most recommended instrument to objectify a patient's subjective experience due to its composition of five domains. Moreover, this result was supported by **Park et al. (2015)**<sup>(23)</sup> who studied "The impact of ureteral stent type on patient symptoms as determined by the ureteral stent symptom questionnaire" they noticed that the information provided to patients reduces the ureteral stent symptoms and helps disclosure of patients' views on treatment, and allows for a comparison of several interventions in the continuous attempt to improve ureteral stent tolerance search for the ideal stent design. This result also comes in agree with a study by **Wiseman et al., (2020)**<sup>(24)</sup> who studied "Effects of silicone hydrocoated double loop ureteral stent on symptoms and quality of life in patients undergoing flexible ureteroscopy for kidney stone" showed that patients who have received good-quality patient education might be less susceptible and less sensitive to symptoms than patients who have been inadequately informed or not at all. So, the patient

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education and monitoring are important to ensure appropriate management and patient satisfaction. These results support the third hypothesis of the research.

The current study examined the mean total ureteral stent discomfort test score among the patients. It found that there was a reduction in this score before, immediately after, and one month after implementing the nursing care standards, with a high statistical significance difference. This means that as the symptoms brought on by the stent's installation fade, so does the degree of discomfort, suggesting that implementing the standards is effective. In this context, **Ramirez et al., (2019)**<sup>(5)</sup> emphasized the same results in their study that 70% of patients with ureteral stents suffer from discomfort and anxiety might be reduced by patient education. In addition, **Miyaoka and Monga (2019)**<sup>(25)</sup>, mentioned in their study entitled "Ureteral stent discomfort: Etiology and management" mentioned that well-informed patient could enjoy a better life and incur fewer costs. Also, this is congruent with a previous study done by **Tanidir et al., (2016)**<sup>(11)</sup> about " Turkish version of the ureteral stent symptoms questionnaire: Linguistic and psychometric validation" reported that the best treatment is preventing ureteral stent complication by providing thorough patient education and developing a computerized tracking system.

Regarding the relationship between all nurses' knowledge, practice, and the patients under study's ureteral stent symptoms and pain. The findings of the present study demonstrated a strong statistical correlation between total nurse knowledge and practice and both total ureteral stent symptoms and ureteral stent discomfort (risk for developing a number of subsequent complications regarding ureteral stent) at baseline, immediately post-implementation, and one month post-implementation. Additionally, there was a statistically significant negative correlation between all nurses' knowledge, practice, and the total number of ureteral stent symptoms and discomfort (risk for developing a number of subsequent complications regarding ureteral stent) of the studied patients at the time of the procedure and one month later. According to the researchers, these findings provide additional justification for the application of nursing care standards, as they increase nurses' knowledge and practice, which in turn improves their performance. Additionally, as patients' level of information increases, ureteral stent symptoms and discomfort decrease, which has a positive effect on patients' outcomes (prevent or lower the number of potential ureteral stent-related complications). comparable to **Ahmed et al., (2022)**<sup>(17)</sup> who mentioned in their study that there was significant statistical negative correlation between nurses' knowledge, practice and total ureteral stent symptoms and discomfort also, the mean scores of nurses in the intervention group were significantly higher than the mean score of nurses in the control group ( $P \leq .001$ ). This study indicates that the implementation of an empowerment program can increase the ability of nurses to detect consequent complications regarding ureteral stent and decrease in their risk that leads to an improvement in the level of ureteral stent symptoms and discomfort. Also, **Liyew et al., (2020)**<sup>(13)</sup> stated that the

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application of different nursing interventions resulted in a positive decrease in the incidence of complications regarding ureteral stent and (ureteral stent symptoms and discomfort) leading to either their prevention or at least decrease the risk of their development. Moreover, **Gaballah and EL-Deen, (2021)<sup>(16)</sup>** emphasized the same results in their study that significant improvements were reported in total scores of nurses' knowledge, practice and total scores of ureteral stent symptoms and ureteral stent discomfort. These results support the fourth hypothesis of the research.

Finally, the current study confirmed the hypotheses that nursing care standards implementation supports nurses' knowledge and practice on patients' outcomes regarding ureteral stent

### **Conclusion:**

According to the findings of the current study, it can be concluded that the implementation of nursing care standards has been shown to be significantly effective in improving nurses' level of knowledge and practice on patients' outcomes with regard to ureteral stents and showed a significant improvement and a lesser incidence of complications as illustrated by nurses' overall knowledge level; nurses' overall practice level, and had a positive impact on patients' outcomes evidence. Also, there was statistically significant positive correlation was found between total nurses' knowledge, practice and total (ureteral stent symptoms and ureteral stent discomfort) of the studied patients mean scores pre implementation of the nursing care standards while a significant statistical negative correlation at immediate post and after one month of implementation of the nursing care standards.

### **Recommendations:**

**The following recommendations can be suggested in light of the study's findings:**

1. There is a need for an ongoing planned education and training program offered on a regular basis for nurses to improve their knowledge and practice towards following nursing care standards recommendations to implement the procedure correctly to achieve high quality nursing care for ureteral stent patients.
2. The availability of a simplified and comprehensive printed booklet for ureteral stent patients about all therapeutic instructions, and threatening complications could increase patients' awareness; understanding, decrease ureteral stent symptoms and discomfort will result in significantly better outcomes.
3. Educational program is necessary for patients with ureteral stent for meeting their educational needs.

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### الملخص العربي

## تأثير تطوير وتنفيذ معايير الرعاية التمريضية على نتائج المرضى فيما يتعلق بدعامات الحالب

**الخلفية:** تعد دعامات الحالب هي واحدة من أهم الأدوات المستخدمة في علاج حالات المسالك البولية المختلفة للحفاظ على سالكية الحالب. على الرغم من أنها ناجحة للغاية، إلا أن معظم المرضى يعانون من آثار جانبية مرتبطة بالدعامات، وبعضهم يعانون من مضاعفات مرتبطة بها يمكن تجنبها من خلال الرعاية التمريضية والممارسات القياسية. **الهدف:** تقييم تأثير تطوير وتنفيذ معايير الرعاية التمريضية على نتائج المرضى فيما يتعلق بدعامات الحالب. **تصميم البحث:** تم استخدام تصميم بحث شبه تجريبي لتحقيق هدف الدراسة الحالية باستخدام نهج ما قبل / بعد الاختبار. **مكان البحث:** أجريت الدراسة الحالية في ثلاثة أماكن؛ قسم جراحة المسالك البولية، قسم المسالك البولية و عيادة المسالك البولية الخارجية بالمستشفى الجامعي في بنها، محافظة القليوبية، مصر. **عينة البحث:** عينة متاحة مكونة من 40 ممرض أو ممرضة من كلا الجنسين الذين يقدموا الرعاية لمرضى دعامة الحالب وعينة غرضية تتكون من 72 مريضاً من الأماكن المذكورة سابقاً خلال تسعة أشهر في هذه الدراسة. **الأدوات:** تم استخدام ثلاث أدوات لجمع البيانات: (1) استبيان منظم للممرضات والذي يتكون من البيانات الشخصية للممرضات ومعرفة الممرضة فيما يتعلق بإدارة دعامة الحالب، (2) قائمة المراجعة الرقابية لممارسة الممرضات، (3) استبيان مقابلة تقييم المرضى. **النتائج:** أظهرت النتائج زيادة إجمالي متوسطات المعرفة والممارسات لدى الممرضات الى حد ذو دلالة إحصائية بعد تطبيق معايير الرعاية التمريضية. كما يتضح من انخفاض إجمالي أعراض دعامة الحالب، وانخفاض متوسط درجات الانزعاج بعد مباشرة وبعد شهر واحد من متابعة تنفيذ معايير الرعاية التمريضية. كما وجدت علاقة ارتباط موجبة ذات دلالة إحصائية بين معرفة الممرضات الكلية وممارستها ومجموع (أعراض دعامة الحالب وانزعاج دعامة الحالب) للمرضى الذين خضعوا للدراسة يعني الدرجات قبل تطبيق معايير الرعاية التمريضية بينما كانت هناك علاقة سلبية ذات دلالة إحصائية بين الممرضات المعرفة والممارسة والإجمالي (أعراض دعامة الحالب وعدم الراحة في دعامة الحالب) للمرضى الخاضعين للدراسة مباشرة وبعد شهر واحد من تنفيذ معايير الرعاية التمريضية. ( $P = <0.001$ ) **الخلاصة:** متوسط المعرفة والممارسة لدى الممرضات الذين تعرضوا لمعايير الرعاية التمريضية حول دعامة الحالب كانت أعلى من الناحية الإحصائية من تنفيذ معايير الرعاية التمريضية السابقة، وكان لها تأثير إيجابي على نتائج المرضى يتضح من انخفاض إجمالي أعراض دعامة الحالب، وانخفاض متوسط درجات الانزعاج. **التوصيات:** هناك حاجة إلى برنامج تعليمي وتدريب مخطط مستمر يتم تقديمه على أساس منظم للممرضات لتحسين معارفهم وممارساتهم نحو اتباع توصيات معايير الرعاية التمريضية لتنفيذ الإجراء بشكل صحيح لتحقيق رعاية تمريضية عالية الجودة لمرضى دعامة الحالب.